

Peter Bobrowsky
Hans Rickman
Editors

Comet/Asteroid Impacts and Human Society

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An Interdisciplinary Approach

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(Editors)

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An Interdisciplinary Approach

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 Springer

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Dr. Peter T. Bobrowsky

Geological Survey of Canada
Landslides and Geotechnics
ESS/GSC-CNCB/GSC-NC/EDS
Natural Resources Canada
601 Booth Street
K1A 0E8 Ottawa, ON
Canada
E-mail: Peter.Bobrowsky@nrcan-rncan.gc.ca

Dr. Hans Rickman

Uppsala Astronomical Observatory
Box 515
SE-751 20 Uppsala
Sweden
E-mail: Hans.Rickman@astro.uu.se

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Preface

The International Council for Science (ICSU) recently recognized that the societal implications (social, cultural, political and economic) of a comet/asteroid impact on Earth warrants an immediate consideration by all countries in the world. Given the paucity of information on this important issue, ICSU thus contacted the International Astronomical Union (IAU) and the International Union for Geological Sciences (IUGS) to address the topic on behalf of the global science community.

This volume provides a summary of opinions regarding the controversy of fact vs. fiction in dealing with comet and asteroid impacts. Each contribution provides a timely state-of-the-art and state-of-the-science synthesis regarding the likelihood and implications of past, present and future comet/asteroid impacts and their effect on human society. Individual chapters represent a wide range of disciplines, specialties and topics which are either directly or indirectly related to impact events. In this way, this book differs considerably from previous comet/asteroid impact books as well as most other natural hazard volumes that commonly focus on a single discipline of study. Our goal in compiling this volume was to ensure that representatives from ancillary disciplines (anthropology, archaeology, economics, geography, atmospheric sciences, political science, psychology and so on) had the opportunity to contribute to the discussion by astronomers and geologists and therefore broaden the restrictive vision normally accorded to topical discussions of natural hazards. Our aim is to widen the appeal of the subject of natural hazards to include specialists that deal with the subject but lack an appreciation of the related implications surfacing from other disciplines. Moreover, the papers were written with the non-scientist in mind, with the expectation to better inform and educate decision makers, politicians and the general public at large about the diverse nature of the physical and social consequences which have in the past, and will in the future, arise from an impact of a comet or asteroid with our planet Earth.

This volume is clustered into three parts comprising 33 chapters. The focus of this book provides those individuals interested in multi-hazard interdisciplinary research a concise appraisal of what is currently known regarding the threat of comet/asteroid impacts, the likelihood and magnitude of such events in the future, an historic review of past impacts based on geological, archaeological and anthropological evidence, an elaboration on the likely physical effects of a significant impact, the ecological and atmospheric effects following an impact, the psycho-sociological implications associated with risk, hazards and disasters as well as the financial, economic and insurance consequences of a catastrophic impact on our planet.

Part one covers the ancient (geology), prehistoric (archaeology) and historic (anthropology) record of comet and asteroid events. This includes papers on popular culture and the use of tree ring studies in modern research as well as a review of the analogies of mega catastrophes resulting from volcanic eruptions. Part two contains contributions focused on the status of near-earth object (NEO) surveys, current knowledge of NEO populations in space, physical properties of NEOs, the quantitative risk of impacts and risk reduction scenarios, the physical terrestrial effects of impacts, the atmospheric and oceanic (tsunami) effects of impacts, case studies including the Kaali meteorite and Tunguska events and cryometeors. Part three examines the social science of near-earth objects, perceptions of risk, dynamic risk assessment, social perspectives on hazards, social vulnerability, the potential collapse of society, disaster planning, insurance coverage, economic consequences, communicating impact risk to the public, impact risk communication management, international policies on NEOs and the future of NEO research.

In April 2004 Hans Rickman of the International Astronomical Union (IAU) and Peter Bobrowsky of the International Union for Geological Sciences (IUGS) met with a few key representatives of the comet/asteroid professional community in Paris under the auspices of the International Council for Science (ICSU). At that time, the group was encouraged by ICSU to consider collaboration in an interdisciplinary effort on the subject of comet/asteroid impacts and human society. ICSU was very interested in supporting a research proposal relevant to the topic that explicitly included individuals in broadly allied fields of study that were not normally included in discussions on this subject. The intent of the proposal was to provide an open platform of discussion and interaction between astronomers, geologists, anthropologists, archaeologists, economists, sociologists, geographers, psychologists, journalists and many others interested in natural hazards, disaster management, risk assessment and ancillary fields of study, but focussed specifically on the potential psycho-social and physical consequences of a catastrophic comet or asteroid impact on Earth. Following the initial meeting in April of 2004, IAU and IUGS coordinated a formal proposal submission to ICSU for a Class II grant. Representatives from allied unions including IUGG (International Union of Geodesy and Geophysics), IGU (International Geographic Union) and IUPsyS (International Union of Psychological Science) agreed to contribute to the working efforts of the project. Similarly, specialists in other disciplines including anthropology, archaeology, medicine, and so on, but not official representatives of their respective ICSU unions also agreed to contribute to such a project. Shortly thereafter, ICSU approved the grant proposal. An Advisory group consisting of the following individuals was struck: Harry Atkinson (UK NEO Task Force), Clark Chapman (Member at Large), Viacheslav Gusiakov (IUGG), Wing-Huen Ip (COSPAR), Michael MacCracken (SCOR) and Stefan Michalowski (OECD). Invitations were then sent to noted specialists in varied disciplines to participate in a week long retreat which included technical presentations, breakout group discussions, interactive debates and a local field trip. The retreat was held in early December 2004 in La Laguna, Tenerife, Spain with the local support of Mark Kidger and the Instituto de Astrofísica de Canarias. The Editors are most grateful to Dr. Kidger and the staff and management of the institute for their kind support in facilitating this important meeting.

As an outcome of the workshop, a summation of the current state of the art and science on the subject and a discussion of related key political questions on the hazard lead to the development of a “white paper”. This compilation, aimed as a background document for politicians, is to appear as a separate published document. At the same time, all invited participants were asked to submit a technical manuscript summarizing their specialty, in a format that addressed the multi-disciplinary nature of the meeting. This volume represents the end product of this effort and thus addresses the outputs identified in the original proposal to ICSU.

This volume represents the collective efforts of a great number of individuals. Most importantly, the Editors recognize the hard work of the contributing authors to clearly capture the key issues of their field of expertise and structure this information in a broadly informative nature readable by others outside their field of interest. The Editors also appreciate the support and work of the editorial staff at Springer Verlag who helped them deal with the difficult process of managing modern techniques in copy-editing. Finally the Editors wish to thank all those individuals who kindly provided their time and effort as critical reviewers for the submitted papers; in some cases reviewing several different papers. The critical reviews were important to us and the book, as they add a level of technical acceptability even when some of the opinions of some of the authors were contentious. Each manuscript was initially reviewed by Peter Bobrowsky and/or Hans Rickman and at least two other impartial persons. As a consequence of this referee process, several papers originally submitted to this volume were rejected and are not included in the published volume. The list of reviewers in alphabetical order were: Johannes Andersen, Joe Arvai, Mark Bailey, Elizabeth Barber, Tony Berger, John Birks, Bill Bottke, Edward Bryant, Andrea Carusi, David Carusi, Alberto Cellino, Clark Chapman, Rejean Couture, Curt Covey, John Davis, Robert Dimand, Eric Elst, David Etkin, Marten Geertsema, John Grattan, Richard Grieve, Peter Horn, David Huntley, Monica Jaramillo, Ruthann Knudson, David Kring, Howard Kunreuther, Jose Lozano, Brian Marsden, Bruce Masse, Jay Melosh, Patrick Michel, Millan Millan, Urve Miller, David Morrison, Jon Nott, Andrei Ol’khoverov, Effim Pelinovsky, Benny Peiser, Juri Plado, Alex Rabinovich, Barrie Raftery, Marko Robnik, Paul Slovic, Richard Spalding, Doug Stead, Duncan Steel, John Twigg, Juha Uitto, Giovanni Valsecchi, Don Yeomans, Fumi Yoshida, Ben Wisner, and Colin Wood.

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Peter Bobrowsky
Hans Rickman

November 2006

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